It may be remarked here, that the very high vacua with which we are familiar now-a-days in X-ray and other such tubes, are by no means essential except in the highest grade of *normal* barometers where results depend upon the absolute height of the mercurial column. In the case of instruments in which a correction is found by comparison with a normal, and especially in barographs where the results depend entirely upon differences in the position of the mercurial column, simple methods of filling give entirely satisfactory results. In these cases the pressure due to gases that may be in the vacuum is so nearly constant that no serious error is involved.

Suppose, for example, that the residual air in a barograph tube exerts a pressure of 0.1 inch, which would be inexcusably bad filling. Now, since we set the pen of the barograph to agree, from time to time, with a standard barometer, the only effect the air can have is such as results from changes in temperature or changes in the volume of the vacuum chamber. A 20° change of temperature between settings of the pen is not usual, but in this case would introduce an error of only about 0.003 inch, whence, with reasonably good filling and fairly uniform temperatures the errors from imperfect vacuum are entirely insignificant.

THE WEATHER OF THE MONTH.

By Mr. P. C. DAY, Acting Chief, Climatological Division.

PRESSURE AND WINDS.

The distribution of mean atmospheric pressure for September, 1908, over the United States and Canada, is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and III.

The average sea-level pressure was highest over the upper Ohio Valley and the Middle Atlantic States where the monthly means ranged from 30.10 to 30.15 inches. A similar area with somewhat lower pressure covered the North Pacific coast. A ridge of slightly less average pressure extending eastward and westward across the central portions of the United States connected the above high areas and the pressure diminished northward and southward by moderate gradients.

Pressure averages were slightly below normal over the Canadian Northwest Provinces and at a few points in the extreme Eastern Maritime Provinces; elsewhere over all districts in the United States and Canada the normal was exceeded. Over the Middle Atlantic States it was about .05 inch above, and slightly in excess of that amount over portions of the southern Plains region, and from .05 to .10 inch above over the greater part of the Plateau and Pacific coast districts.

From August to September, 1908, there was a decided increase in pressure over nearly all districts in the United States and over the Canadian Provinces from the Lake region eastward. Over the Florida Peninsula and along the immediate Gulf coast there was a decrease ranging from .01 inch at Jacksonville, Fla., and New Orleans, La., to .08 inch at Key West, Fla. Over the upper Missouri Valley and extending northward into the Canadian Northwest Territories the pressure for September was slightly less than that for August.

Due to the ridge of high pressure extending across the central portions of the United States southerly winds were dominant over nearly all northern districts from the Atlantic to the Pacific, while over the southern portions, especially east of the Mississippi Valley, they were largely from northerly points.

Over the east Gulf and Atlantic coast States there was a general excess of wind movement, but over nearly all the remaining districts of the United States the average wind velocities were considerably less than the normal rate, the deficiency being most pronounced over the southern portion of the Plains region where the wind movement at points was from 20 to 40 per cent less than the average. The great interior districts were remarkably free from severe atmospheric disturbances, the few storm tracks being confined mostly to the more northern districts or off the Atlantic coast.

TEMPERATURE.

September, 1908, was unusually warm over the greater part of the United States and over the whole of Canada as far north as the field of observations extends.

From New England westward over the Lake region, the Ohio, Mississippi, and Missouri valleys to the Rocky Mountains the average for the month ranged from 3° to 7° above the normal.

Over the Atlantic coast districts from southern New England to Florida, along the Gulf coast, in portions of Texas, and at points on the Pacific coast, the average temperature was below the normal by small amounts.

During the first three weeks the temperatures were above the normal over nearly all districts, except along the Atlantic coast, being especially high during the second and third weeks over the great interior agricultural districts. Cooler weather prevailed during the latter part of the month over the districts from the Great Plains westward, but unseasonably warm weather continued to near the end of the month over the districts from the Mississippi Valley eastward. The mean temperature during the second, third, and fourth weeks over the Lake region, Ohio and upper Mississippi valleys, ranged from 10° to 15° per day above the average. During the third week cool weather set in over the Pacific coast and extending eastward covered the Rocky Mountain districts during the following week and the remaining districts farther east by the end of the month.

Maximum temperatures from 90° to slightly above 100° were recorded at intervals during the month over all districts east of the Rocky Mountains, except from the Appalachian Mountains eastward to the Atlantic, over the lower Lake region and New England. Maximum temperatures above 100° were recorded in the interior valleys of California and southwestern Arizona, and they were above 90° over most of the Plateau region.

Minimum temperatures near the freezing point occurred during the latter part of the month as far south as central Texas and from thence northeasterly over the central Mississippi Valley district to the lower Lake region and portions of New England. Temperatures below 20° were recorded over large portions of the central Rocky Mountain and Plateau districts, and below 10° at exposed points in the mountains of Colorado and Wyoming. The minimum temperatures during the latter part of the month were among the lowest ever recorded for September at many points from the north Pacific coast southeasterly over the Plateau, Rocky Mountain, and Great Plains districts to central Texas.

PRECIPITATION.

Precipitation was unusually heavy along the Gulf coast, southeastern Georgia, and over most of the Florida Peninsula, where some very heavy monthly falls occurred, the amount recorded at Jacksonville, 21.79 inches, being the greatest monthly fall in the history of that station. Amounts from 2 to 6 inches occurred over the districts east of the Appalachian Mountains from Maryland southward, and similar amounts were received from Missouri and eastern Kansas southward over most of Arkansas, Oklahoma, Louisiana, and eastern Texas. Unusually heavy precipitation for the section occurred over the central portions of Utah, where the amounts were several times greater than the average.

The severe drought inaugurated during the latter part of August over the Lake region, Ohio and upper Mississippi valleys and adjoining districts continued into September with increasing severity. No general rains occurred over large portions of the above districts from about the 17th of August

until near the end of September, a period unequaled for length of duration without material rainfall in the history of many points in that region. During this period unusually warm weather prevailed thereby intensifying the drought conditions by excessive evaporation. Many springs, wells, and streams dried up and the water in all streams was extremely low, many important industries were compelled to suspend operations and much inconvenience and financial loss were occasioned. The intense heat and dryness augmented the opportunities for the spread of forest fires, and these latter were unusually destructive over portions of New England, New York, western Pennsylvania, and the northern portions of Michigan and Wisconsin.

General rains over the affected districts near the end of the month relieved the pressing need of surface moisture and partially quenched the forest fires, but the amounts were generally insufficient to materially replenish the sources of the streams, and the water supply at the end of the month was still unusually low in many portions of the districts.

The fact that the soil was generally well saturated with moisture over a large part of the district embraced by the drought and the comparative lateness in the growing season prevented any widespread damage to vegetation from the great lack of moisture.

A more complete history of this drought and some comparisons with others will appear in the MONTHLY WEATHER REVIEW for October, 1908.

Precipitation was above the normal over portions of the South Atlantic States, the Florida Peninsula, portions of Oklahoma, Arkansas, Louisiana, and eastern Texas, southern Minnesota, Utah, southern California, and generally over the Plateau and Rocky Mountain districts. Over the remaining districts there was a general deficiency in precipitation amounting to about 2 inches from New England westward to the Lake region, upper Mississippi and lower Missouri valleys, and southward over the Ohio Valley. There was a deficiency of about 2 inches in the lower Rio Grande Valley and a similar amount over the western portions of Oregon and Washington.

HUMIDITY AND SUNSHINE.

The average relative humidity was below the normal from New England westward to the upper Missouri Valley and southward over the greater part of the Atlantic coast and east Gulf districts, Ohio and lower Missouri valleys. In the lower Lake region and portions of the Ohio Valley the averages were from 10 to 15 per cent below the normal. There was also a deficiency in the relative humidity over the southern Rocky Mountain region and over most of the Pacific coast States. Humidity was above the average along the Gulf coast, over the southern portion of the Plains region, and generally over the Plateau and northern Rocky Mountain districts.

Considerable cloudy, foggy weather prevailed along the Atlantic coast, over the Florida Peninsula, and the southern portions of the Gulf States, and along the north Pacific coast. Over the greater part of the Great Plains, the Missouri, Mississippi, and Ohio valleys the sunshine was excessive, being almost continuous during the greater part of the month. Over the greater part of the Lake region, New England, and portions of the Middle Atlantic States much smoke from forest fires prevailed during the latter half of the month, being so dense at times as to cause considerable inconvenience to navigation on the lakes and waterways.

Auroras were reported from a wide extent of territory during the latter part of the month, those of the 29th and 30th being of extraordinary brilliancy and apparently covering the entire northern portion of the United States and large portions of Canada and Alaska.

WEATHER IN ALASKA.

Over the southern coast districts the temperatures continued above freezing thruout the month, except on the higher elevations. The weather was mostly cloudy and rain was of almost daily occurrence, the amounts for the month ranging generally from about 10 to nearly 25 inches. Over the districts about Cook Inlet and the mouth of the Copper River the minimum temperatures were generally near the freezing point; the weather was cloudy and the rainfall moderate. The first snow of the season occurred about the 16th. In the Upper Yukon district the minimum temperatures were generally below freezing, reaching their lowest points about the 25th, when they were but slightly abovo zero. The weather was mostly cloudy, with light rain at frequent intervals and some snow toward the end of the month.

In Canada.—Director R. F. Stupart says:

The temperature was well above the average in all portions of the Dominion; the most noticeable positive departures were 6° to 8° in the Lake Superior district, 4° to 5° in Saskatchewan and Manitoba, and 3° to 5° in the Peninsula of Ontario, and in the Ottawa and upper St. Lawrence valleys.

During the month a severe drought occurred in nearly all portions of the Dominion, the Province of Manitoba proving the exception to the rule with a rainfall in most localities of from 3 to 19 per cent more than the usual amount. In parts of southern Alberta and more locally in southwestern Saskatchewan the rainfall was nil; elsewhere from coast to coast, except in Manitoba as already stated, the quantity recorded was equivalent to about a third of the average.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	12	63.0	+ 2.1	+ 6.2	+ 0.7
Middle Atlantic	16	66.8	+ 0.2	+ 1.3	+ 0.1
South Atlantic	10	72.0	− 1.0	+ 7.3	+ 0.8
Florida Peninsula*	8	79.2	− 0.1	+ 7.1	+ 0.8
East Gulf	11	75.2	+ 0.4	+ 9.8	+ 1.1
West Gulf	10	75.5	+ 0.1	+13.2	+ 1.5
Ohio Valley and Tennessee	13	71.2	+ 2.9	+11.7	+ 1.3
Lower Lake	10	66.4	+ 3.5	+ 5.3	+ 0.6
Upper Lake	12	64.5	+ 5.6	+15.9	+ 1.8
North Dakota*	9	60.6	+ 3.6	+20.5	+ 2.3
Upper Mississippi Valley	15	69.3	+ 4.5	+14.2	+ 1.6
Missouri Valley	12	69.8	+ 4.6	+20.3	+ 2.3
Northern Slope	9	59.6	+ 2.2	+ 8.9	+ 1.0
Middle Slope	6	68.8	+ 1.3	+14.8	+ 1.6
Southern Slope*	7	71.9	− 1.1	+ 6.9	+ 0.8
Southern Plateau*	12	69.8	− 0.8	− 2.5	− 0.3
Middle Plateau*	10	59.5	− 0.8	− 4.2	− 0.5
Northern Plateau*	12	59.5	+ 1.2	+ 5.8	+ 0.6
North Pacific	7	56.0	− 0.9	− 1.8	− 0.2
Middle Pacific	8	64.9	+ 0.5	− 0.1	0.0
South Pacific	4	68.5	+ 1.2	+ 4.8	+ 0.5

* Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	12	1.05	33	−2.10	−4.70
Middle Atlantic	16	2.30	70	−1.00	−1.10
South Atlantic	10	4.78	102	+0.10	+1.60
Florida Peninsula*	8	10.55	136	+2.80	−1.70
East Gulf	11	3.62	93	−0.30	−0.80
West Gulf	10	4.62	135	+1.20	+2.80
Ohio Valley and Tennessee	13	1.18	42	−1.60	−2.80
Lower Lake	10	1.03	36	−1.80	−1.10
Upper Lake	12	2.06	63	−1.20	−0.90
North Dakota*	9	1.04	72	−0.40	+0.30
Upper Mississippi Valley	15	1.83	55	−1.50	+0.50
Missouri Valley	12	0.91	33	−1.80	+1.30
Northern Slope	9	1.20	109	+0.10	+2.60
Middle Slope	6	1.90	95	−0.10	+4.60
Southern Slope*	7	2.69	96	−0.10	+4.60
Southern Plateau*	12	0.69	70	−0.30	+0.50
Middle Plateau*	10	1.30	168	+0.50	+0.90
Northern Plateau*	12	0.93	100	0.00	−1.10
North Pacific	7	0.69	28	−1.80	−4.40
Middle Pacific	8	0.06	11	−0.50	−4.40
South Pacific	4	0.60	300	+0.40	−0.72

* Regular Weather Bureau and selected cooperative stations.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.9	— 0.1	Missouri Valley	3.4	— 0.6
Middle Atlantic	4.8	0.0	Northern Slope	4.0	0.0
South Atlantic	4.7	— 0.1	Middle Slope	3.1	— 0.1
Florida Peninsula	5.6	+ 0.1	Southern Slope	3.3	+ 0.3
East Gulf	5.3	+ 0.9	Southern Plateau	2.3	0.0
West Gulf	4.9	+ 0.6	Middle Plateau	3.5	+ 1.0
Ohio Valley and Tennessee	3.2	— 1.2	Northern Plateau	3.8	— 0.3
Lower Lake	2.9	— 1.9	North Pacific	4.9	0.0
Upper Lake	4.4	— 0.7	Middle Pacific	4.1	+ 1.3
North Dakota	4.0	— 0.3	South Pacific	3.2	+ 0.7
Upper Mississippi Valley	3.3	— 0.9			

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	78	— 3	Missouri Valley	63	— 3
Middle Atlantic	76	— 1	Northern Slope	58	+ 3
South Atlantic	80	0	Middle Slope	63	+ 5
Florida Peninsula	83	+ 1	Southern Slope	67	+ 4
East Gulf	76	0	Southern Plateau	44	+ 2
West Gulf	77	+ 3	Middle Plateau	47	+ 9
Ohio Valley and Tennessee	66	— 6	Northern Plateau	51	— 1
Lower Lake	66	— 7	North Pacific	76	— 2
Upper Lake	74	— 3	Middle Pacific	59	— 4
North Dakota	65	— 1	South Pacific	66	0
Upper Mississippi Valley	70	— 2			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Alpena, Mich	30	51	s.	Mount Weather, Va	28	57	nw.
Canton, N. Y	28	52	sw.	Oklahoma, Okla	22	56	n.
Galveston, Tex	17	62	ne.	Point Reyes Light, Cal.	6	50	nw.
Jacksonville, Fla	6	57	w.	Do	7	59	nw.
Minneapolis, Minn	22	50	w.	Do	14	53	nw.
Modena, Utah	6	56	sw.	Do	15	50	nw.
Do	16	52	sw.	Do	16	63	nw.
Mount Tamalpais, Cal	6	60	nw.	Do	17	52	nw.
Do	7	58	nw.	St. Paul, Minn	22	52	nw.
Do	14	62	nw.				